

Airline Transport

Boeing 727 transport, here being tested on the 707 prototype aircraft, include triple-slotted trailing edge flaps, leading edge flaps and slats. The 727 design has undergone some changes as a result of data from wind tunnel studies, including movement of the top engine inlet forward to a position parallel with the other two engines, straightening of the inlet cowling from an old slanted position and redesign of the top leading edge of the vertical fin.



HIGH-LIFT DEVICES for the Boeing 727 transport, here being tested on the 707 prototype aircraft, include triple-slotted trailing edge flaps, leading edge flaps and slats. The 727 design has undergone some changes as a result of data from wind tunnel studies, including movement of the top engine inlet forward to a position parallel with the other two engines, straightening of the inlet cowling from an old slanted position and redesign of the top leading edge of the vertical fin.

Boeing 727 Test Program to Exceed 707s

By Glenn Garrison

New York—Pre-serving test program for the Boeing 727 three-engine jet transport will cost about \$50 million of company funds and exceed the 707 series testing in scope, company officials said last week.

During the two-year test program, two complete 727 airframes will be tested to destruction. The static test program will be more complete than in previous cases. Previously, the programs involved simple proof loads without destroying the airplane, but loads in the 727 program will be carried to the point of failure. One purpose of the tests will be to trace sequence in which failures occur so that design can be improved and airlines advised of weak spots to keep under observation.

The production program for the short-to-medium range jet is on schedule, one year after the decision to build it was announced, along with the initial orders. Current backlog is 117 aircraft, with United and Eastern each committed for 40 planes, American for 25 and Lufthansa for 12.

Break-even sales level still appears to be 200 aircraft, according to J. B. Connelly, Boeing vice president and assistant general manager of the transport division. Boeing is still a long way from breaking even on the 707 program, Connelly said, and the decision to build the 727 was not taken lightly. Jet era experience by manufacturers and operators has been anything but successful financially so far, Connelly said. The basic 727 will sell for about \$4.25 to \$4.35 million.

There are some good present prospects for sales in both domestic and foreign markets, Connelly reported. However, financing is a problem for potential customers, and another factor is the time element, with the plane scheduled for first deliveries in late 1965. There is little urgency to order an aircraft which could not be delivered until at least 1964.

Connelly said break-even load factor for the 727 in all-convex configuration is about 45% and for mixed configuration the figure is 50%. The aircraft will carry 70 to 114 passengers. Contracts totaling \$122 million to 500 subcontractors and suppliers have been let during the past year, Connelly said. Boeing is using its Wichita facility for its large parts tooling program and Seattle for its large parts fabrication. About 50% of structural items and 75% of equipment items are covered by contracts already let.

The 727 test program is unique, according to Maynard L. Pennell, transport division director of engineering, in that 4,500 hr. of wind tunnel testing already has been accomplished, and there has been extensive use of the 707 prototype in testing high-lift devices and the rear engine configuration.

One area checked with the single engine mounted toward the rear of the prototype fuselage was possible starvation of the inlet at high nose angles. At altitudes of 35,000-40,000 ft., tests resulted in surging of the third engine, but to a lesser degree than the normal four-pod-mounted engines showed.

One reason for more extensive testing of the 727 was the rougher treat-

ment it will get in shorter-haul operations with more landings and takeoffs, Pennell said.

Pennell said Boeing believes rear-engine mounting configuration ideal for a three-engine plane, but not for a four-engine plane. If Boeing were designing another four-engine jet, Pennell said, the engines probably would be mounted in wing pods as was done with 707, not in the rear as in the British Vickers VC.10 four-engine British jet.

The rear-engine mounting entails some disadvantages, Pennell said, including weight and balance and in some aerodynamic areas. On the other hand, there are aerodynamic advantages in other areas.

The 727, which will be landing on relatively short runways, will be equipped with thrust reversers providing about 50% of available thrust, compared to about 35% for the 707, Pennell said. Also, boxing up of the brakes is planned with greater braking areas to help alleviate the problem of multiple landings and short runways. A braking parachute will not be used.

Approach speed is estimated at about 130 kt. for the 727. This compares with about 135 kt. by the book for the 707, although in practice the approach speeds have been considerably higher. With the 720, the comparable approach speed was down to 122 kt., according to Pennell.

Asymmetrical thrust problems have been largely overcome with the 727 configuration, Pennell said, and its tender is designed almost entirely for cross-wind handling rather than asymmetrical conditions.